

Bitcoin does consume a lot of energy – but here's why it's worth it

Some people question bitcoin's legitimacy because it uses huge amounts of electricity to maintain its network. But that's not a failing, says Dominic Frisby – it's what gives it value.

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27 JAN 2021



Many bitcoin mining operations, such as this one in Russia, use renewable energy

Today we attempt to address an argument that has resurfaced this week. That is the argument that bitcoin is somehow, for environmental reasons, unethical or immoral, because it uses a lot of electricity.

This is one of those arguments that never goes away – and I’m afraid it will never go away. Like Scottish independence or Brexit. “Bitcoin’s a bubble” is another one.

There are those who get bitcoin, see its potential and invest. There are those, such as Nobel-prize winning economists and Financial Times journalists, who are determined not to, and have been talking it down ever since it was a dollar ten years ago.

I guarantee that after this article bitcoiners will say “yup, he’s right”, while nocoiners will find fault. But perhaps the undecided middle will find it instructive.

Bitcoin mining consumes a lot of energy – but much of it is renewable

Bitcoin mining (the process by which bitcoins are produced and the network maintained) does consume extraordinary amounts of energy. Research by Digiconomist, shows energy consumption at 77.78 terawatt-hours per year. That’s comparable to the total energy consumption of the Netherlands, which has a population of 17.5 million people.

As a result, bitcoin mining operations gravitate to locations where energy is cheap. Iceland, with its abundant geothermal energy, was a hotspot for many years. Unwanted land close to nuclear power stations, especially in France, found use.

Half of global mining now takes place in one region of China – Sichuan. Why? Hydroelectricity. During the rainy season, its electricity prices are as low as anywhere in the world. Roughly 5% of Sichuan bitcoin mining power comes from nuclear or burning coal. 95% is from renewables.

Research by Coinshares concludes that the Bitcoin network obtains 74% of its electricity from renewable sources. “Many renewable energy generators are poorly located and underutilised, and thus, Bitcoin mining has become the only viable use for this electricity,” says strategist Tatiana Revoredo.

Ironically, bitcoin makes better use of renewable energy sources than almost any other large-scale industry in the world. One company in Sweden is even recycling the heat generated from bitcoin mining to heat greenhouses.

“Imagine a 3D topographic map of the world with cheap energy hotspots being lower and expensive energy being higher. I imagine Bitcoin mining being akin to a glass of water poured over the surface, settling in the nooks and crannies, and smoothing it out,” says researcher Nic Carter of Coinmetrics.io.

But does it need to consume so much energy? Can’t we just redesign it so it consumes less? The answer is no. Its power consumption is essential to its success.

“What would Bitcoin really be worth if, in order to care for the world it set out to revolutionise, it changed its algorithm, or if miners unhooked themselves from cheap power?” asks Bloomberg’s Lionel Laurent. The answer is very little. Laurent says that is “a real price mystery”. But it really isn’t.

Here’s why bitcoin needs to use so much energy

The reason bitcoin works so well is because it uses so much power. The reason the network is so strong is its electricity consumption. That is why it

has been so successful. This power consumption is built in. It is called “proof of work”.

In 1997, a young English computer programmer by the name of Adam Back proposed a system to limit email spam and denial-of-service (DoS) attacks (DoS attacks are attempts, usually by hackers, to make a computer or a network unusable). Like many good ideas, the principle behind Back’s idea was simple: he would make spam uneconomic.

Spam is predicated on being able to send large numbers of emails at low cost. But if each individual email involves effort and cost, then the spam becomes uneconomic, and so less likely to happen.

Back’s idea was that emails should contain evidence that some kind of effort had gone into their composition – a proof of work. An email that contains some kind of proof of work is an email that is less likely to contain spam. He developed a system called “Hashcash”. This added a textual stamp to the header of an email. It was proof that the sender had expended a certain amount of time in writing and sending the email.

In 2004, another computer programmer, Hal Finney, built on Back’s proof-of-work system. Finney’s idea was that each proof of work could be re-used, so that the work that went into them would not have to be repeated. He called it “reusable proof of work”.

If a Hashcash stamp could become a token denoting a certain amount of work, it would have some kind of value. In other words, Hashcash stamps could work as a form of digital money. Finney was highly regarded in the computer-programming world, but his system never saw any economic use. Until “Satoshi Nakamoto”, the as yet unidentified inventor of bitcoin.

When Nakamoto first designed bitcoin, one of his key ideas was that money should have a cost of production to it. If something takes effort, then it has value. If no effort goes into something, why on earth should it have any value?

Nakamoto wanted a system of money whose purchasing power increases over time, so he limited money supply to a maximum of 21 million coins. But he couldn't create the coins all at once. It had to be gradual. So how to create coins? How to disseminate them? And how to maintain the system? His ingenious solution to it all was what he called mining.

Just as gold and silver cost money to mine, so do bitcoins. However, you don't mine bitcoins with picks, shovels and drills, but with computers. You can set up a gold mining company and start digging – in your back garden if you like – but there is no guarantee you'll find anything. It's the same with bitcoin. You can rig up some computers and start bitcoin mining, but there is no guarantee you will get some coins out of it.

But there is a chance you will strike gold – or successfully mine coins. The better your gold or bitcoin mining operation – the more powerful your drills, or your geological mapping, or your computers – the better the chance you'll strike gold or bitcoin. And the potential reward is such that people take the risk.

Every ten minutes, a block of new bitcoins is mined. And thousands of bitcoin mining operations around the world – thousands of powerful computers – compete with each other to mine the block and get the bitcoin reward. It is the combined power of all these computers that processes all the transactions and maintains the network.

Energy use is bitcoin's "moat"

Early bitcoins were easy to mine. There was not much competition, the network was small. But, as bitcoin evolved, the mining process grew more intense. The more intense the mining process, the more resilient bitcoin becomes.

In the past, to make something safe you would build a wall or a moat around it. Bitcoin's blockchain is protected by a metaphorical digital wall, made secure by all the energy expended securing it. It would take an equivalent amount of energy to tear it down – and as such is almost impossible to do. Bitcoin pioneer Nick Szabo calls this "unforgeable costliness".

Money is stored energy. You expend energy working and in exchange receive money. You can then expend that stored energy later and receive in exchange a product or service – somebody else's stored energy.

As humans have developed from the Agricultural Revolution, when we started to use animals to labour for us, to the Industrial Revolution, when we started to use machines, to today's digital age and computers, we have consumed more energy per capita. Energy consumption is part of progress. Everything requires energy. Even the energy required for a simple Google search is enough to power a lightbulb for several minutes. And as human beings have progressed we have found better means to provide that energy.

Bitcoin is a digital asset, minted from energy. It is stored digital energy. That is why it has value. Bitcoin's electricity consumption is not a fault – it's a feature.

You might think that another person's activity is a waste of energy. They might not think so. It is subjective. Bitcoiners will say that bitcoin mining is an extraordinarily good use of power. What you get in exchange is a monetary network that is extraordinarily robust, permissionless, censorship free and resistant to state actors. Nocoiners will say it is an unethical waste.

And then there's the fact that that bitcoin network consumes much less electricity than existing fiat systems, which have enormous and far less efficiently used electricity requirements to power their banking infrastructure, not to mention associated political and military activities. Don't get me started on government waste.